

Angular Leaf Spot on Strawberries

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Angular leaf spot, caused by the bacterium *Xanthomonas fragariae*, seems to be problematic in numerous strawberry plantings this spring. This disease is favored by cold, wet conditions, so given the weather we've had across the state this spring, it's no surprise that we are seeing problems. The bacteria get spread within a planting by splashing of water droplets. Needing to use overhead irrigation for frost protection can make the problem worse.

It is important to note that because this disease is caused by a bacterium, rather than a fungus, fungicides used to control other diseases will not have an effect.

Symptoms may vary a bit in coloration depending on the plant variety, weather conditions, and time of year. Key diagnostic features, however, are that the lesions are confined by the small veins of the leaf and the infected areas appear as a lighter color when the leaf is held up to the light, as the bacteria cause the tissue to clear. Thus, the lesions have a blocky or "angular" appearance, sometimes referred to as a "windowpane" effect. As infected areas accrue, blocks of damage tissue die and turn a brown or red-brown color. In the photo below on the left, there is a small amount of infected tissue on a young leaf, so tiny areas of infected tissue are seen. In the photo on the right, more tissue has been infected for a longer period of time.



When infected tissue is viewed with light shining on it, instead of through it, the infected areas appear dark. In the photos below, recently infected tissue can be seen on the leaf underside as blocky dark green areas that turn black as the tissue dies. Once the tissue dies, the infection is obvious on both the upper and lower leaf surface. Again, note the angular shape of infected areas.



Angular leaf spot also affects the fruit cap (calyx). The caps may have a blackened appearance if they have not had an opportunity to dry out, and after a dry spell may be described as brown rather than black. This is the symptom that often gets people's attention as the fruit becomes unsalable.



Botrytis gray mold, caused by a fungus, can also turn caps brown. If the caps turn brown and you don't know which disease is causing the caps to discolor, check to see whether leaf symptoms of angular leaf spot are also present, and if they are, this is likely the problem. If they aren't, gray mold may be the issue. An additional clue is that if gray mold is the problem, the berry tissue will also eventually turn soft as it becomes infected, whereas with angular leaf spot, the berry tissue remains normal in appearance. The berry often doesn't develop much sweetness with either one, presumably because sugars cannot be translocated into the fruit normally.

Angular leaf spot and leaf scorch, a disease caused by a fungus, are also easily confused so here are photos to help you tell the difference. These photos are of the same two leaves, held differently so sunlight either shines down on them, or through them. The primary disease affecting the leaf on the left is leaf scorch, and the one on the right, angular leaf spot. In the photo on the left, where sunlight is shining down on the leaves, the two

leaves appear very similar. In the photo on the right, where the same two leaves are held up so that sunlight shines through, you can see that light does not shine through the leaf on the left with leaf scorch, but the “windowpane” effect of angular leaf spot can be clearly seen on the leaf on the right. Note that in these two leaves, there is some of each disease present on each leaf.



No strawberry varieties have resistance to angular leaf spot. It is systemic within plants, and cannot be eradicated. The bacteria can also invade the plant’s vascular system, causing a general decline, but this is less commonly seen than other symptoms.

Cultural controls consist of minimizing the amount of overhead irrigation used, and any practices that encourage drying of foliage such as keeping plantings weeded. Straw mulch can help minimize water droplet splashing, and avoiding moving equipment or harvesters through wet foliage will minimize the spread of inoculum. As mentioned above, commonly-used fungicides don’t help with controlling this disease. Copper can help though phytotoxicity symptoms, which will appear as a general reddening or purpling of the leaves, may appear if more than four or five sprays are used. Avoid applications when temperatures are warm (higher than the mid-70s). Copper also tends to accumulate in the soil, so routine use without a reason is not recommended. Making applications early in the season will minimize infected leaf material, and prior to wet spells as temperatures become warmer may help to protect the caps. The main purpose of copper sprays is to protect tissue from infected bacterial slime, so if you are in a dry period, you can skip sprays for awhile and save them for when you might need them later. Copper hydroxide formulations may be more effective than copper sulfate formulations.

Photos: K. Demchak